

**We Claim:**

1. A soluble copolymer of vinyl monomers having multiple unsaturation and having the general formula  $[(Ax)(By)]_n$ , wherein A and B are vinyl monomers that are insoluble in organic solvent and A is vinyl monomer comprising single unsaturation, B is vinyl monomer containing multiple unsaturation and x, y and n are integral values greater than zero.
2. The soluble copolymer as claimed in claim 1, wherein the vinyl monomer comprising single unsaturation is selected from the group consisting of acrylates, methacrylates, acrylamides comprising of methyl methacrylate, ethyl acrylate, butyl acrylate, acrylic acid, methacrylic acid, acrylonitrile, vinyl acetate, glycidyl methacrylate, 2-hydroxyethyl methacrylate, 2-hydroxyl propyl methacrylate, 2-amino ethyl acrylate hydrochloride butyl acrylate cetyl acrylate, cetyl methacrylate, phenol methacrylate, N-isopropyl acrylamide, acrylamide, N-t-butyl acrylamide, styrene and styrene sulfonic acid.
3. The soluble copolymers as claimed in claim 1, wherein the vinyl monomer with multiple unsaturations is selected from the group consisting of diacrylates, dimethacrylates, tri or tetra acrylates or methacrylates comprising ethylene glycol dimethacrylate, trimethylol propane trimethacrylate, pentaerythritol trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, glycerol dimethacrylate, glycerol diacrylate, vinyl methacrylate, vinyl acrylate, trimethylol propane triacrylate, pentaerythritol tetraacrylate or aromatic divinyl compounds.
4. The soluble copolymer as claimed in claim 1, wherein the aromatic divinyl compound is divinyl benzene.
5. The polymer composition as claimed in claim 1, wherein the content of the monomer with multiple unsaturation in the copolymer may be varied from 0.01-99.9%.
6. A process for the preparation of soluble copolymers of vinyl monomers having general formula  $[(Ax)(By)]_n$ , wherein A is vinyl monomer comprising one unsaturation, B is vinyl monomer containing multiple unsaturation and x, y and n are integral values greater than zero, the said process comprising the steps of:
  - a. dissolving an inclusion complex of a monomer containing multiple unsaturation with a cyclic macromolecular compound in a solvent;

- b. adding a vinyl monomer having single unsaturation and a free radical initiator to the reaction mixture of step (a) and polymerizing the solution thus formed to obtain the soluble copolymer.
7. A process as claimed in claim 6, wherein the inclusion complex of the monomer containing multiple unsaturation is obtained by:
- (a) dissolving  $\beta$ -cyclodextrin in water;
  - (b) adding ethylene glycol dimethacrylate to the reaction mixture of (a) and stirring the same to form a precipitate;
  - (c) filtering the precipitate and washing the same with water and methanol, and
  - (d) drying the washed precipitate to obtain the inclusion complex.
8. A process as claimed in claim 6, wherein the vinyl monomer with single unsaturation is selected from the group consisting of acrylates, methacrylates, acrylamides comprising of methyl methacrylate, ethyl acrylate, butyl acrylate, acrylic acid, methacrylic acid, acrylonitrile, vinyl acetate, glycidyl methacrylate, 2-hydroxyethyl methacrylate, 2-hydroxyl propyl methacrylate, 2-amino ethyl acrylate hydrochloride butyl acrylate cetyl acrylate, cetyl methacrylate, phenol methacrylate, N-isopropyl acrylamide, acrylamide, N-t-butyl acrylamide, styrene and styrene sulfonic acid.
9. A process as claimed in claim 6, wherein the vinyl monomer with multiple unsaturation is selected from the group consisting of diacrylates, dimethacrylates, tri or tetra acrylates or methacrylates comprising ethylene glycol dimethacrylate, trimethylol propane trimethacrylate, pentaerythritol trimethacrylate, pentaerythritol tetramethacrylate, bisphenol A dimethacrylate, glycerol dimethacrylate, glycerol diacrylate, vinyl methacrylate, vinyl acrylate, trimethylol propane triacrylate, pentaerythritol tetraacrylate or aromatic divinyl compounds.
10. A process as claimed in claim 6, wherein the aromatic divinyl compound is divinyl benzene.
11. A process as claimed in claim 6 wherein in step (a), the solvent used is polar aprotic solvent.
12. A process as claimed in claim 11, wherein the polar aprotic solvent used is selected from the group comprising of N, N dimethyl formamide, N, N dimethyl acetamide, dimethyl sulfoxide and water.
13. A process as claimed in claim 6 wherein in step (a), the free radical initiator used is a thermal initiator or a photosensitive initiator.

14. A process as claimed in claim 13, wherein the thermal initiator is selected from the group comprising of azo initiators, peroxide type initiators and redox type initiators.
15. A process as claimed in claim 14, wherein the azo initiator used is azobisisobutyronitrile.
16. A process as claimed in claim 14, wherein the peroxide initiator used is selected from benzoylperoxide and t-butyl hydroperoxide.
17. A process as claimed in claim 14, wherein the redox initiator used is potassium persulphate and ammonium persulphate.
18. A process as claimed in claim 13, wherein the photosensitive initiator is selected from the group comprising of cumene hydroperoxide, benzoin ethyl ether, 2, 2-dimethoxy-2-phenyl acetophenone, 1-hydroxy cyclohexyl-1-phenyl ketone (Irgacure-184), bis (2,4,6-trimethyl benzoyl) phenyl phosphine (Irgacure-819).
19. A process of preparation of a crosslinked polymer from the soluble copolymers of claim 1, the said process comprising the steps of:
  - a. dissolving soluble copolymer of claim 1 in a solvent along with a free radical initiator, and
  - b. heating or irradiating the mixture of step (a) to obtain the cross linked polymer.
20. A process as claimed in claim 19, wherein in step (a) the free radical initiator used is a thermal initiator or a photo initiator.
21. A process as claimed in claim 19, wherein the thermal initiator is selected from the group comprising of azo initiators and peroxide type initiators.
22. A process as claimed in claim 21, wherein the azo initiator used is azobisisobutyronitrile.
23. A process as claimed in claim 21, wherein the peroxide initiator used is selected from benzoylperoxide and t-butyl hydroperoxide.
24. A process as claimed in claim 19, wherein the photo initiator is selected from the group comprising of cumene hydroperoxide, benzoin ethyl ether, 2, 2-dimethoxy-2-phenyl acetophenone, 1-hydroxy cyclohexyl-1-phenyl ketone (Irgacure-184), bis(2,4,6-trimethyl benzoyl) phenyl phosphine.
25. A process as claimed in claim 19 wherein in step (b), the reaction mixture is heated upto temperature in the range of 40 to 80°C under inert atmosphere to obtain the cross-linked polymer.